

## PATENT COOPERATION TREATY

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## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference PD030135	<b>FOR FURTHER ACTION</b>		See Form PCT/IPEA/416
International application No. PCT/EP2004/053448	International filing date (day/month/year) 14.12.2004	Priority date (day/month/year) 18.12.2003	
International Patent Classification (IPC) or national classification and IPC G09G3/28, G06F1/035			
Applicant THOMSON LICENSING et al			
<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 7 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input checked="" type="checkbox"/> <i>sent to the applicant and to the International Bureau</i> a total of 8 sheets, as follows:</p> <p><input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</p> <p>b. <input type="checkbox"/> <i>(sent to the International Bureau only)</i> a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p>			
<p>4. This report contains indications relating to the following items:</p> <p><input checked="" type="checkbox"/> Box No. I Basis of the opinion</p> <p><input type="checkbox"/> Box No. II Priority</p> <p><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p><input type="checkbox"/> Box No. IV Lack of unity of invention</p> <p><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p><input type="checkbox"/> Box No. VI Certain documents cited</p> <p><input type="checkbox"/> Box No. VII Certain defects in the international application</p> <p><input type="checkbox"/> Box No. VIII Certain observations on the international application</p>			
Date of submission of the demand  18.10.2005		Date of completion of this report  14.03.2006	
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465		Authorized Officer  Morris, D  Telephone No. +49 89 2399-2182	



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ON PATENTABILITY**

International application No.  
PCT/EP2004/053448

**Box No. I Basis of the report**

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
- ☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
- ☐ international search (under Rules 12.3 and 23.1(b))
  - ☐ publication of the international application (under Rule 12.4)
  - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements\*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

**Description, Pages**

1-12 as originally filed

**Sequence listings part of the description, Pages**

18-33 as originally filed

**Claims, Numbers**

1-7 received on 21.10.2005 with letter of 18.10.2005

**Drawings, Sheets**

1 as originally filed

☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☒ The amendments have resulted in the cancellation of:

- ☐ the description, pages
- ☒ the claims, Nos. 8-14
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (*specify*):
- ☐ any table(s) related to sequence listing (*specify*):

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (*specify*):
- ☐ any table(s) related to sequence listing (*specify*):

\* If item 4 applies, some or all of these sheets may be marked "superseded."

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**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

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1. Statement

Novelty (N)	Yes: Claims	1-7
	No: Claims	
Inventive step (IS)	Yes: Claims	1-7
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-7
	No: Claims	

2. Citations and explanations (Rule 70.7):

**see separate sheet**

**Re Item V**

**Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Reference is made to the following documents:

D1: US-A-5 999 581 (BELLAOUAR ET AL) 7 December 1999 (1999-12-07)

D2: EP-A-1 353 314 (DEUTSCHE THOMSON-BRANDT GMBH) 15  
October 2003 (2003-10-15)

- 2.1 D1 discloses (- cf. present independent claim 1) a device for generating [output values] (- Fig. 1) for a given value of a parameter (- "OUTPUT" - Fig. 1) among N different values (-  $2^{(n+m)}$  - Fig. 1), whose output values can be approximated by a piecewise linear function of a variable depending on the given value (- "digital sine function and/or cosine function waveforms" - col. 1, line 9 and "INPUT WORD FIW" - Fig. 1), the set of N values being divided into P subsets of consecutive values (-  $2^m$  subsets, 22 - Fig. 1, "partitioned into m most significant bits" - col. 2, line 47), each piece of the piecewise linear function being in a different subset.
- 2.2 In addition, D1 further discloses the device comprises corresponding features of:
- a first memory (- 22a or 22b - Fig. 1) for storing, for each subset i, a primary look-up [value] associated to a bound value of the subset i (- "stores k-bit digital samples representing amplitude points along a portion of a sine function" - col. 2, lines 52-55);
  - ~~a second memory for storing,~~ for each subset i, a delta look-up [value] (-  $2^n$  - Fig. 1) corresponding to the difference between a secondary look-up [value] and the primary look-up [value] related to the subset i, the secondary look-up [value] being associated to the other bound value of the subset i;
  - [..]
  - a fourth memory (- 24a or 24b - Fig. 1) for storing an extrapolation coefficient (-  $\alpha$  or  $\beta$  - Fig. 1 and col. 2, lines 59-67) for each one of said N values, the extrapolation coefficient associated to a given value being defined in accordance with the value of a variable S for said given value and the values of the variable S for the two bound values of the subset i comprising said given value  
(- "l-bit digital value [...] associated with one of the digital samples stored in the look-up table [22a / 22b]" - col. 2, lines 61-63 and 64-66); and

- a computing block (16, 18, 30, 36, 38, 40, 50 - Fig. 1) for generating [output values], for the given value in accordance with the extrapolation coefficient, primary look-up [value] and delta look-up [value]
  - (- "The multiplier 40 which receives the n-least significant bits from the 1st complement block 18 and the interpolation coefficients .alpha. and .beta., calculates the interpolation value to be added to or subtracted from the output digital sample of the sine or cosine function waveform. The logic value of the control input ctl2 to the adder/subtractor 38 determines whether the interpolation value is added to or subtracted from the digital sample to generate the intermediate digital sample. Thus, memory 24 storing the interpolation coefficients .alpha. and .beta., multiplier 40 and adder/subtractor 38 function as a linear interpolator identified generally by reference numeral 50" - col. 3, lines 33-43).

- 2.3 It is acknowledged that D1 fails to disclose corresponding features of:
- generating a look-up table;
  - primary look-up tables associated to respective bound values of a subset i;
  - a second memory for storing, for each subset i, a delta look-up table corresponding to the difference between a secondary look-up table and the primary look-up table related to the subset i, the secondary look-up table being associated to the other bound value of the subset i; or
  - a third memory for storing, for each of said N values, an index indicating which primary look-up table in the first memory and which delta look-up table in the second memory have to be used for extrapolation.

The subject-matter of claim 1 is therefore new (Article 33(2) PCT).

- 2.4 D2 discloses a method of generating a look-up table (- 13 - Fig. 3, MTC LUT 133 - Fig. 4) for a given value of a parameter (- AP - Fig. 3) among N different values (- "256 discrete codes implemented"- para. [0058], line 4), whose output values can be approximated by a piecewise linear function of a variable
- (- "selects the sustain table to be used [...] from about 120 sustain pulses to 1200 sustain pulses" - para. [0050], lines 8-10)
- depending on the given value
- (- "The control block 12 consults its internal power level [....]" - para. [0050], lines 7- 10).

2.5 In addition, D2 also discloses a problem of the implementation of embodiment disclosed in Fig. 3 is that

(- "One problem of the above described implementation is the large size of the look-up tables which would be expensive to implement. In fact, for the implementation of a single metacode with the bit width as described on the above figure, 15360 bits of LUT would be required. If 256 discrete codes are implemented, 3.93 M bit of LUT data would be required." - para. [0058]).

wherein it is submitted that the person skilled in the art is encouraged by the disclosure of D2 to seek out solutions to the problem of providing a means for generating a look-up table for metacodes while reducing the size of the look-up tables required to generate the a different set of metacodes for each different measured value of the average power level.

3.1 The problem to be solved by the present invention may be regarded as how to reduce the memory required to implement a plurality of look-up tables.

The solution to this problem proposed in present claim 1 of the present application is considered as involving an inventive step (Article 33(3) PCT) for the following reasons:

- i) while D2 indicates that the problem of a large memory being required for implementing metacodes using look-up tables was known in the art, D2 neither discloses nor suggests any method for overcoming this problem;
- ii) while D1 discloses a method of overcoming a problem of requiring large look-up tables in the generation of high resolution sine or cosine function waveforms in the field of digital frequency synthesizers (- see e.g. Fig. 1 of D1 and also col. 1, lines 23-28 of D1), D1 extrapolates output values for the sine / cosine waves from single primary values of a single primary look-up table, together with values from a look-up table for storing corresponding extrapolation values. There is no suggestion or disclosure in D1, either explicit or implicit, to substitute the primary look-up values disclosed in D1, i.e. stored in look-up tables [- 22a, 22b - Fig. 1 of D1] with primary look-up tables comprising a plurality of primary values.

As such therefore, the subject matter of the device claimed in respect of present independent claim 1 is considered to comprise a combination of known measures which mutually support each other to such an extent that a new technical effect is

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achieved.

Accordingly, in light of PCT Guidelines 13.14(d), the subject matter of independent claim 1 is considered to involve an inventive step over a combination of the teachings of D1 and D2 within the meaning of Article 33(3) PCT.

- 3.2 Claims 2-7 are dependent on claim 1 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

## CLAIMS

1. Device for generating a look-up table for a given value (VAL) of a parameter (APL) among N different values, whose output values can be approximated by a piecewise linear function of a variable (S(VAL)) depending on the given value, the set of N values being divided into P subsets of consecutive values, each piece of the piecewise linear function being in a different subset, characterized in that it comprises:
- a first memory (101) for storing, for each subset i, a primary look-up table (PMTC<sub>i</sub>) associated to a bound value of the subset i,
  - a second memory (102) for storing, for each subset i, a delta look-up table corresponding to the difference between a secondary look-up table (SMTC<sub>i</sub>) and the primary look-up table (PMTC<sub>i</sub>) related to the subset i, the secondary look-up table (SMTC<sub>i</sub>) being associated to the other bound value of the subset i,
  - a third memory (103) for storing, for each of said N values, an index indicating which primary look-up table in the first memory (101) and which delta look-up table in the second memory (102) have to be used for extrapolation,
  - a fourth memory (104) for storing an extrapolation coefficient (C) for each one of said N values, the extrapolation coefficient (C(VAL)) associated to a given value being defined in accordance with the value (S(VAL)) of a variable S for said given value (VAL) and the values (S(PMTC<sub>i</sub>), S(SMTC<sub>i</sub>)) of the variable S for the two bound values of the subset i comprising said given value; and
  - a computing block (105) for generating a look-up table, for the given value (VAL) in accordance with the related extrapolation coefficient (C(VAL)), primary look-up table (PMTC<sub>i</sub>) and delta look-up table.
2. Device according to claim 1, characterized in that the parameter is an average power level and the variable (S(VAL)) is a number of sustain pulses corresponding to the given value (VAL) of the parameter



and that it generates a Metacode look-up table for each average power level value.

3. Device according to claim 2, characterized in that the bound level related to the primary look-up table (PMTC<sub>i</sub>) of a subset of average power level values is the highest average power level value of the subset and the bound level related to the secondary look-up table (SMTC<sub>i</sub>) of a subset of average power level values is the lowest average power level value of the subset.

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4. Device according to one of the claims 1 to 3, characterized in that the ratio between the value (S(PMTC<sub>i</sub>)) of the variable for one bound value in the subset i and the value (S(PMTC<sub>i+1</sub>)) of the variable for the same bound value in the subset i+1 equals to a fixed parameter  $\alpha$ .

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5. Device according to the claim 4, characterized in that the parameter  $\alpha$  is defined as followed :  $\alpha = \sqrt[N]{\frac{S_{MAX}}{S_{MIN}}}$

where  $S_{MAX}$  is the value of the variable (S) for a peak white image and  $S_{MIN}$  for a full white image.

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6. Device according to one of the claims 1 to 5, characterized in that the extrapolation coefficient (C(VAL)) equals to :

$$C(VAL) = \frac{S(VAL) - S(PMTC_i)}{S(SMTC_i) - S(PMTC_i)}$$

where - S(PMTC<sub>i</sub>) is the value of the variable for the highest bound value of the subset i;

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- S(SMTC<sub>i</sub>) is the value of the variable for the lowest bound value of the subset i; and

- S(VAL) is the value of the variable for the given value.

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7. Device according to one of the claims 1 to 6, characterized in that the computed look-up table equals to the sum of the output of the primary look-up table ( $\text{PMTC}_i$ ) for the given value (VAL) and the output of the delta look-up table ( $\text{PMTC}_i$ ) for the given value (VAL) weighted by the
- 5 extrapolation coefficient for the given value (VAL).